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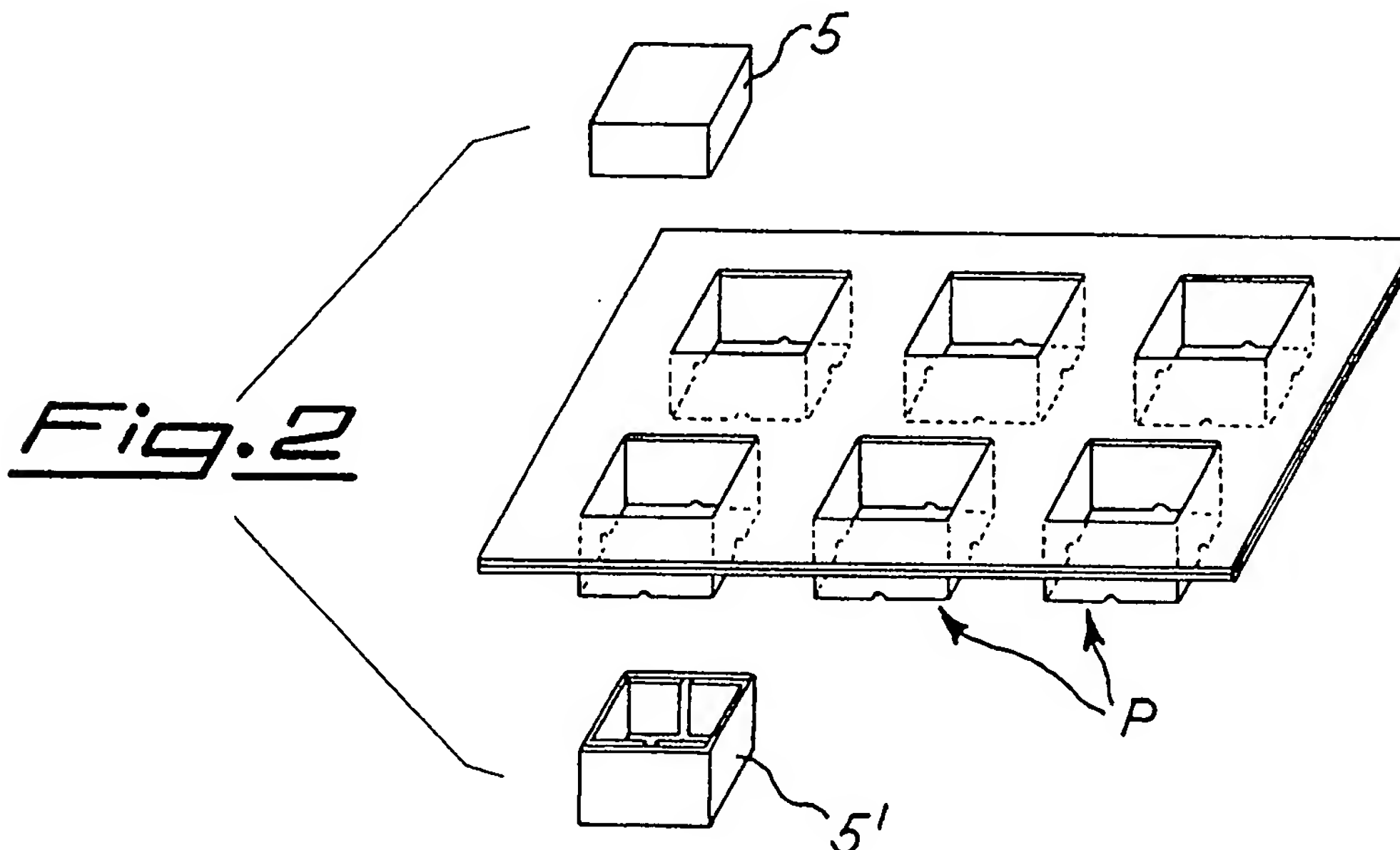
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(54) **Pallets of corrugated cardboard and process for their production.**

(57) A pallet for handling loads comprises two or more superimposed blanks (1, 2; 1a, 2a) of corrugated cardboard, each presenting a plurality of die-cut flaps (3; 3a) folded in a same direction with the relevant corrugation direction (F) substantially normal to the plane of said blanks, in correspon-

dence to the flaps of the upper and/or lower blank and cooperating therewith and with a plurality of elements (5, 5') holding said folded flaps in position to form a plurality of supporting feet of the pallet itself.



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The present invention concerns a support for handling loads of the type known as pallet or portable platform, made of corrugated cardboard, as well as a process for the production thereof.

Pallets of corrugated board have been known for some time: these products have been developed to solve the problems arising in connection with wood pallets. In fact, though wood pallets were designed to be used for several times, today, due to logistic problems related to storage and recovery, they are generally used only once, thus leaving the problem of their disposal.

On the contrary, the material of cardboard pallets can be very easily recycled; however, their diffusion has been so far hindered by the lack of embodiments suitable to overcome in an easy and economic way the problems related to lower resistance and stiffness of corrugated cardboard versus wood.

An object of the present invention is therefore that of providing a pallet made of corrugated cardboard capable of solving the aforesaid problems of resistance and rigidity by way of a simple and economic structure.

A further object of the invention is to provide a process to produce a cardboard pallet in an easy and economic way. Said objects are achieved by means of the present invention that concerns a pallet for handling loads, of the type consisting of a plurality of elements of corrugated cardboard, characterized in that it comprises two or more superimposed blanks of corrugated cardboard, each blank being provided with a plurality of die-cut flaps bent in a same direction substantially normal to the plane surface of said blanks, said flaps being positioned in correspondence to the flaps of the upper and/or lower blank and cooperating therewith and with a plurality of elements holding said folded flaps in position to form a plurality of supporting feet for the pallet, and in that the corrugations of the folded flaps cardboard are normal to the plane of said blanks.

The invention also concerns a process for the production of a corrugated cardboard pallet or similar support for handling loads, characterized in that it comprises the following steps:

die-cutting a plurality of blanks of corrugated cardboard and providing on each blank a plurality of foldable flaps; superimposing at least two of said blanks, with said flaps at least partly overlapping each other;

folding the flaps normally to said blanks plane, on the same side, the direction of each folded flap corrugation being normal to the plane of said blanks;

applying a multiplicity of holding elements keeping said folded flaps normally to the blanks and forming a plurality of supporting feet for said pallets.

According to one advantageous feature of the invention, the holding elements cooperating with the folded flaps to form the supporting feet of the pallet also serve as reinforcing elements and are consisted of cardboard boxes positioned inside and/or outside the projecting structure formed by the folded flaps.

In particular, the size of the thus formed feet is larger than the average distance between the axes of two adjacent rollers in a known roller conveyor, thus enabling moving the pallet on said currently available roller conveyors. Said feet are moreover spaced from each other of a length sufficient to house the forks of pallets handling equipment. Preferably the feet are also dimensioned in a way that those of one pallet can be housed in the spaces provided for the above cited forks in a second -upturned-pallet and this in order to save space during transporation and storage, by suitably superimposing the formed pallets.

The invention will be now further described with reference to the accompanying drawings given by way of illustration and with no limiting purposes, where:

- figure 1 is a perspective view of two blanks of corrugated cardboard according to the invention;
- figure 2 is a perspective exploded view of the blanks of figure 1 superimposed, with folded flaps and strengthening elements;
- figure 3 is a partially sectional magnified view of the flaps projecting and cooperating with each other;
- figure 4 and 4a are perspective views of strengthening elements;
- figure 5 is a partial and magnified perspective view of a supporting foot of a finished pallet;
- figure 6 is a perspective view similar to figure 1 but with a different die-cut of the foldable flaps;
- figure 7 is a top view of a strengthening element blank; and
- figure 8 is an exploded view similar to figure 5, as obtainable from figure 6 blanks.

Figure 1 shows two die-cut blanks, 1 and 2, of corrugated cardboard which are forming the surface or loading base of the pallet itself. Each blank is provided with a plurality of die-cut flaps 3 which, as shown in the following figures 2 and 3, once the pallet is formed, are folded in the same direction, forming a substantially right angle with the level of the relevant blank.

In order to obtain higher stiffness and resistance of flaps 3 to the bending and compressive stress, flaps 3 are die-cut in a way that their free end 4 is substantially perpendicular to the direction of the corrugation axis (i.e. to the axis of the wrinkles - or alternated ridges and grooves) of the

relevant blank of corrugated cardboard, direction shown by arrow F in figures 1, 5 and 8. The corrugation of the folded flaps will thus result substantially perpendicular to the loading surface represented by blanks 1 and 2.

The pallet resistance is furtherly increased by coupling the continuous cardboard blanks with their respective waves perpendicular to each other, as shown in figures 1 and 8.

Now with reference to the preferred embodiment of figures 1 to 5, which envisages the use of two blanks, the flaps 3 are die-cut in couples on blanks 1 and 2 in a way that, when superimposing the two blanks, they are positioned in correspondence to each other and normal to one another. In other words, by superimposing the blanks 1 and 2, the free sides 4 of the flaps on one blank must be substantially perpendicular to the sides 4 of the flaps of the other, upper or lower, blank. This arrangement is necessary in that the four folded flaps cooperating with each other to form a structure projecting from blanks 1 and 2, indicated by reference P in figures 2 and 3 and corresponding to the pallet supporting feet, must have a direction of the corrugation axes which is perpendicular or substantially perpendicular to the level of the superimposed blanks 1 and 2.

The so folded flaps preferably provide a parallelepiped structure, as shown in figure 3 or, alternatively, a very slightly truncated-cone structure to allow at least part of a foot to be housed into the corresponding structure of the underlying pallet in a pile of superimposed pallets. In figure 6 are shown two blanks, 1a and 2a, of corrugated cardboard having "S" shaped flaps 3a. In this case flaps 3a shape is the only difference from blanks 3 of previously disclosed figures 1-3: all other features are identical and apply to this embodiment and, namely, the perpendicularity requirements of free sides 4 of flaps 3a with respect to the corrugation axes are met. The advantage of this embodiment is that the height of supporting feet P is greater and insertion of the fork of a pallet moving device is thus facilitated. From another point of view, the advantage is that with the same height of pallet feet a smaller area is required for flaps 3a and thus a greater blank area is available as loading surface. In any case, flaps 3 are provided with positioning elements to keep them in the desired position, namely perpendicular to the level of blanks 1 and 2. Said positioning elements may consist of small tongues 8 and slots 9 arranged in a complementary way on flaps 3 (figure 5), or alternatively of other elements designed for that purpose.

In the illustrated preferred embodiment, to obtain sufficient stiffness and resistance to the combined bending and compressing stress, the pallet

supporting feet, i.e. the projecting structures P formed by the folded flaps cooperate with a corresponding plurality of holding elements which also serve as strengthening elements.

Said strengthening elements may be made of any material suitable therefor, but preferably consist of corrugated cardboard boxes. Said boxes 5, 5' (fig. 2) are positionable inside and/or outside the projecting structure P formed by the folded flaps 3 and are preferably secured to said flaps and/or to the plane surface of the blanks, thus contributing to hold in position flaps 3 and to form the pallet supporting feet.

As shown in figures 4, 4a and 7 (disclosing the blank of a preferred box), where the direction of the cardboard corrugation is shown by arrows F, some sides, in this case sides 6, of the reinforcing boxes necessarily present a corrugation direction parallel to the plane of blanks 1 and 2, namely perpendicular to the direction of the loading stresses. In order to improve resistance and rigidity of boxes 5, 5', at least said sides 6 are on their turn strengthened, i.e. by means of further foldings 6' of the corrugated cardboard forming the boxes themselves or by means of tongues, usually glued, having the required direction of the corrugation.

Figure 5 shows a magnified perspective view, in partial section, of a finished pallet foot according to the invention.

In this pallet, the supporting feet comprise four flaps 3 each, die-cut from two superimposed blanks 1 and 2, and folded downward of said blanks and forming a right angle therewith.

The feet are also provided with a box 5 serving as holding and strengthening element, housed inside the structure formed by the folded flaps, and with a second box 5' positioned outside said flaps and having the same functions as box 5.

In figure 8 is depicted an exploded view similar to above cited figure 5, the flaps 3a being the "S" shaped ones disclosed with reference to figure 6. Because of the shape of flaps 3a, each "wall" of structure P formed by the folded flaps has a missing area 9. The preferred arrangement shown in figure 8 provides for an alternated position of said area 9, i.e. a "flap 3a - area 9 - flap 3a - area 9" disposition. However, also the other possible combination, having two couples of flaps 3a adjacent and forming two corners, can be used.

As far as the pallet structural features are concerned, the corrugated cardboard from which blanks 1 and 2 are made is preferably of the double type, while the reinforcing elements, namely boxes 5 and 5', are made of simple type corrugated cardboard.

The size of the pallet supporting feet is greater than the distance between two adjacent rollers, that is, the distance between the axes of two adjacent

rollers in a roller conveyor of the type currently used for handling loaded pallets, so as to ensure an easy moving on said conveyors of the pallets according to the invention. Moreover the feet height and their reciprocal arrangement are such as to allow the forks of pallet handling devices, such as transpallets and the like, to be housed therebetween, as well as to allow the feet of another pallet to be housed, updown, therebetween in a space-saving disposition, to facilitate the pallets transportation and storage.

The production of the aforescribed pallets takes place according to the following steps: at first a plurality of corrugated cardboard blanks are die-cut providing a plurality of foldable flaps on each blank. The flaps are die-cut with their free side normal to the direction of the corrugation of its cardboard blank, so that once folded the direction of the corrugation is substantially parallel to that of the combined bending and compressing stresses, i.e. it is substantially perpendicular to the plane of blanks 1 and 2.

Then two or more die-cut blanks are superimposed and their flaps are at least partly superimposed to each other. At this point the flaps are folded normally or with very slight inclination to the plane of said blanks, on the same side, forming a plurality of structures projecting from said blanks, which are subsequently provided with holding and strengthening elements that are fastened in a known way to said flaps, in order to obtain a corresponding plurality of supporting feet of said pallets.

In the preferential process to obtain the embodiments to which figures 1 to 8 are referring, the flaps are die-cut in opposed couples and two die-cut blanks are superimposed in which the overlapping flaps are perpendicular to each other.

Thus, in this case, each foot will comprise four flaps cooperating with said holding-positioning and strengthening elements.

In order to improve the resistance of the loading surface and to obtain the right corrugation direction of the folded flaps, adjacent blanks are superimposed with their relevant corrugations perpendicular to each other. It is pointed out that in the embodiment of the two-blank type shown in figures 1 to 8, this "perpendicular corrugation" arrangement is necessary to be able to obtain folded flaps with relevant corrugation substantially perpendicular to the plane surface constituted by blanks 1 and 2.

Claims

1. A pallet for handling loads, of the type consisting of a plurality of corrugated cardboard elements, characterized in that it comprises two

or more superimposed blanks (1, 2; 1a, 2a) of corrugated cardboard, each blank presenting a plurality of die-cut flaps (3; 3a) folded in a same direction substantially normal to the plane surface of said blanks, said flaps (3; 3a) being positioned in correspondence to the flaps of the upper and/or lower blank and cooperating with them and with a plurality of elements (5, 5') holding in position said folded flaps to form a plurality of supporting feet of the pallet itself, and in that the corrugation direction (F) of the folded flaps (3; 3a) cardboard is substantially normal to the surface of said blanks.

2. A pallet according to claim 1, characterized in that the corrugation directions (F) of two superimposed blanks (1, 2; 1a, 2a) are normal to each other.
3. A pallet according to claim 1 or 2, characterized in that said holding elements (5, 5') also act as reinforcing elements.
4. A pallet according to claim 3, characterized in that said reinforcing elements are consisted of corrugated cardboard boxes placed inside and/or outside the structure (P) formed by said folded flaps.
5. A pallet according to claim 4, characterized in that those walls (6) of said boxes presenting a corrugation direction (F) parallel to the plane of said blanks (1, 2; 1a, 2a) are reinforced by means of further foldings (6') of the corrugated cardboard forming them.
6. A pallet according to any of the preceding claims, characterized in that said corrugated cardboard is a double type cardboard.
7. A pallet according to any of the preceding claims, characterized in that said supporting feet have larger size than the distance between the axes of two contiguous rollers of a currently used roller conveyor and/or sufficient size and arrangement to house therebetween forks of pallet handling device.
8. A pallet according to claim 7, characterized in that its feet are houseable between the feet of an identical upturned pallet.
9. A pallet according to any previous claim, characterized in that said flaps (3a) are "S" shaped.
10. A pallet according to any of the preceding

claims, characterized in that it comprises two superimposed die-cut blanks (1, 2; 1a, 2a), each blank having a plurality of die-cut flaps (3; 3a) couples folded to form a plurality of projecting feet consisting of four flaps each and provided with an internal box (5) and/or with external box (5') to hold in position and reinforce said feet structure (P).

11. A process for the production of a pallet made of corrugated cardboard for handling loads, characterized in that it comprises the following steps:
- die-cutting a plurality of corrugated cardboard blanks (1, 2; 1a, 2a) providing on each blank a plurality of foldable flaps (3; 3a), the free side (4) of which is substantially normal to the corrugation direction (F) of said corrugated cardboard;
- superimposing at least two of said blanks, with said flaps (3; 3a) at least partly overlapping each other;
- folding said flaps (3; 3a) on a same side with respect to the plane of said blanks (1, 2; 1a, 2a), forming a plurality of structures (P) projecting from said blanks, the corrugation direction (F) of each folded flap being substantially normal to the plane of said blanks; and
- applying a multiplicity of holding elements (5, 5') to said projecting structures keeping said folded flaps in substantially normal position to the blank and forming a plurality of supporting feet of said pallets.
12. A process according to claim 11, characterized in that a plurality of holding and reinforcing elements (5, 5') is applied inside and/or outside said projecting structures (P).

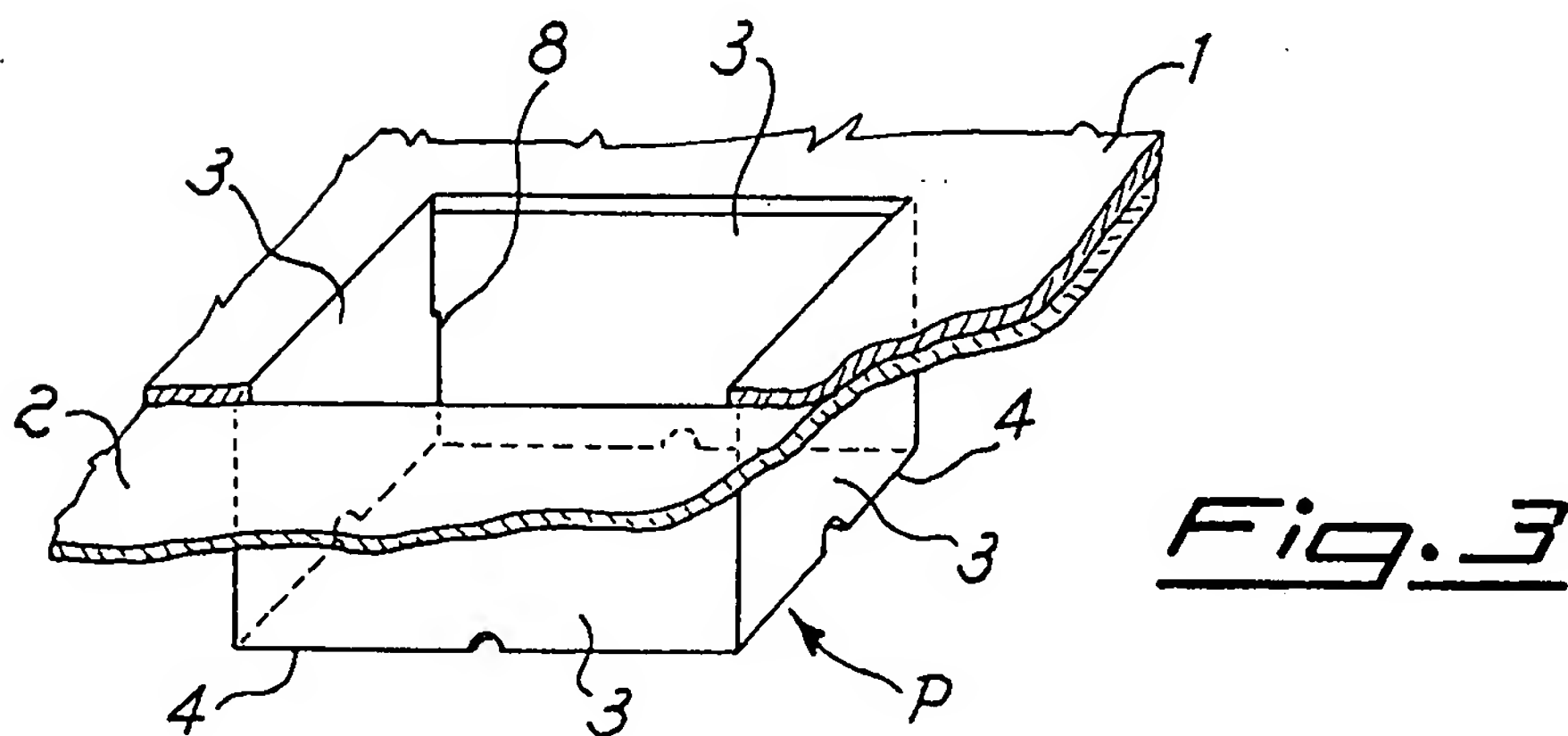
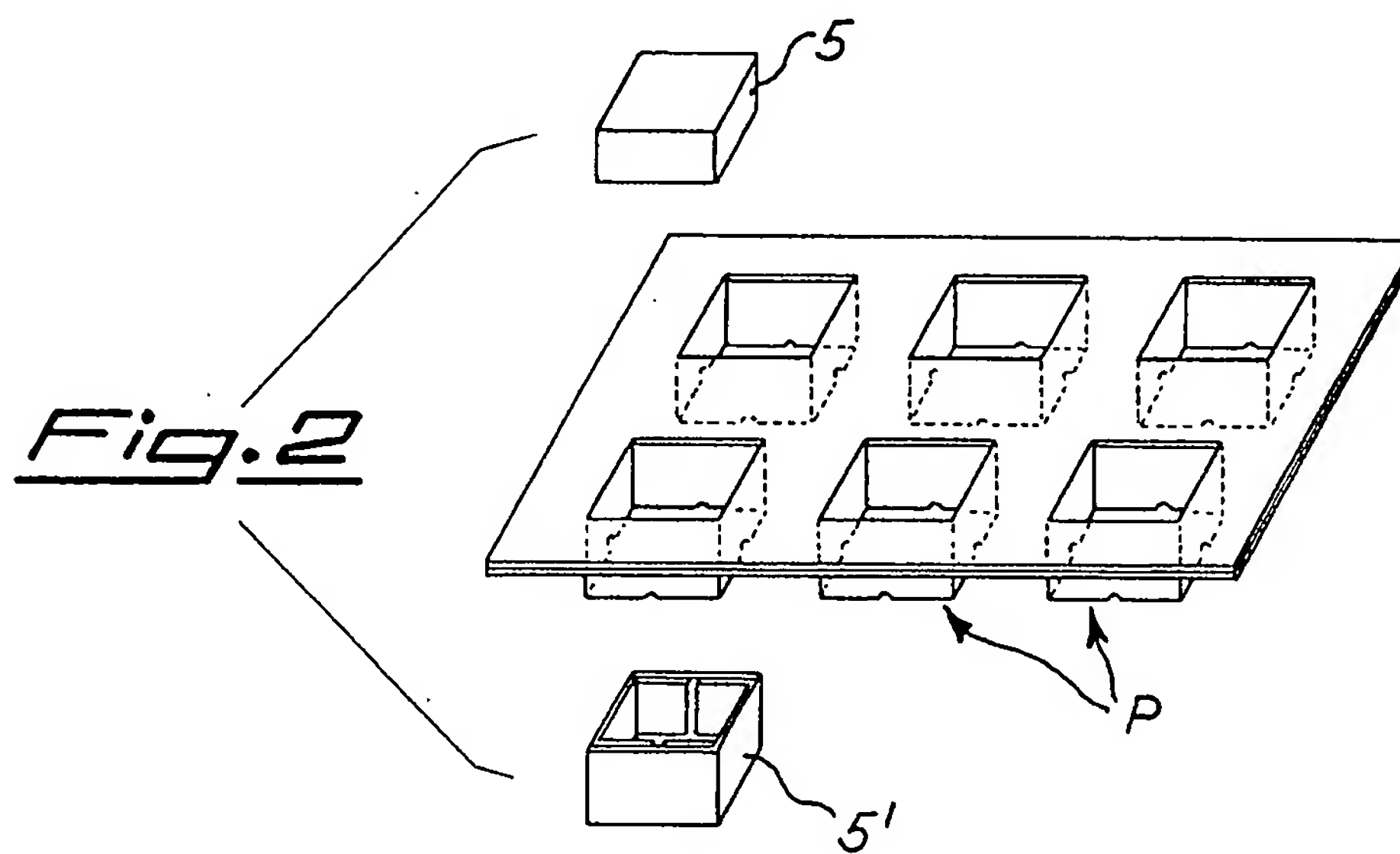
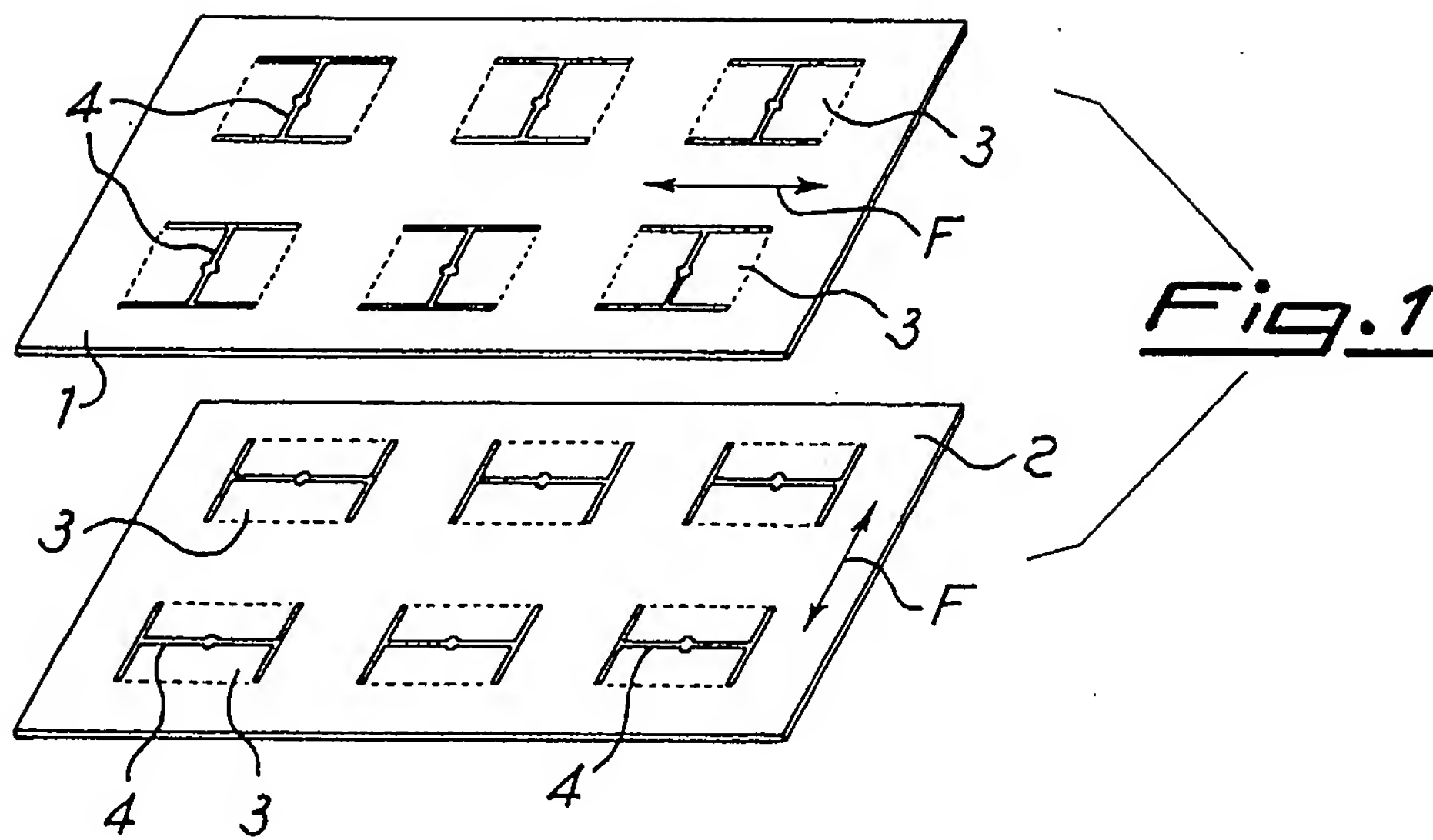


Fig. 4a

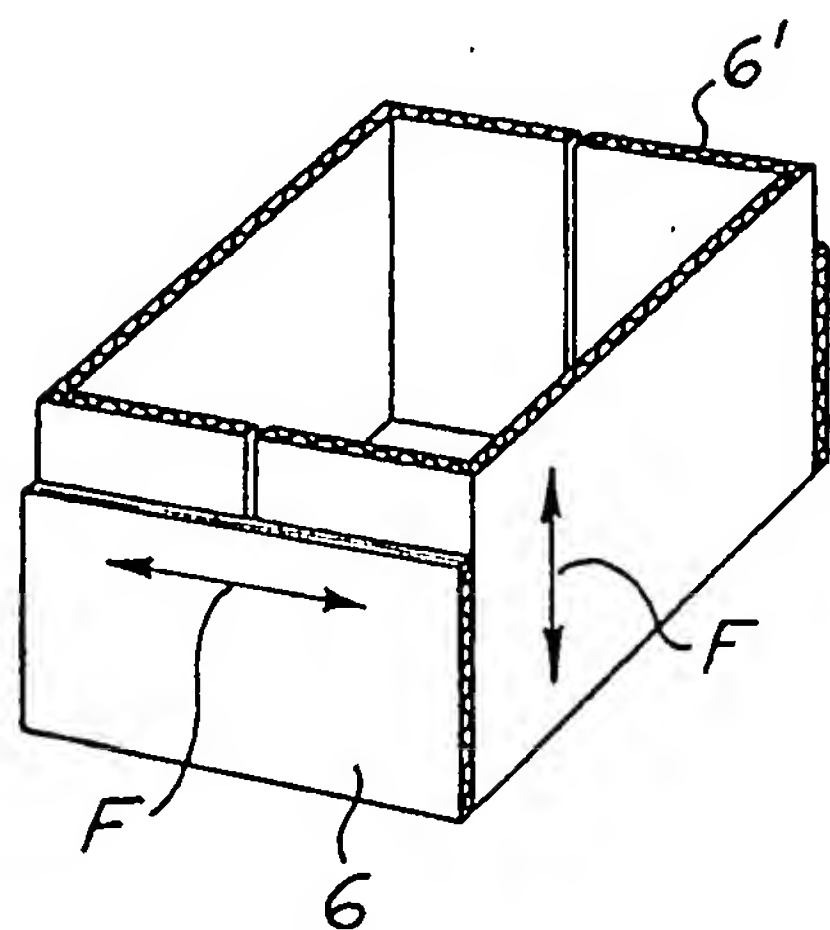


Fig. 4

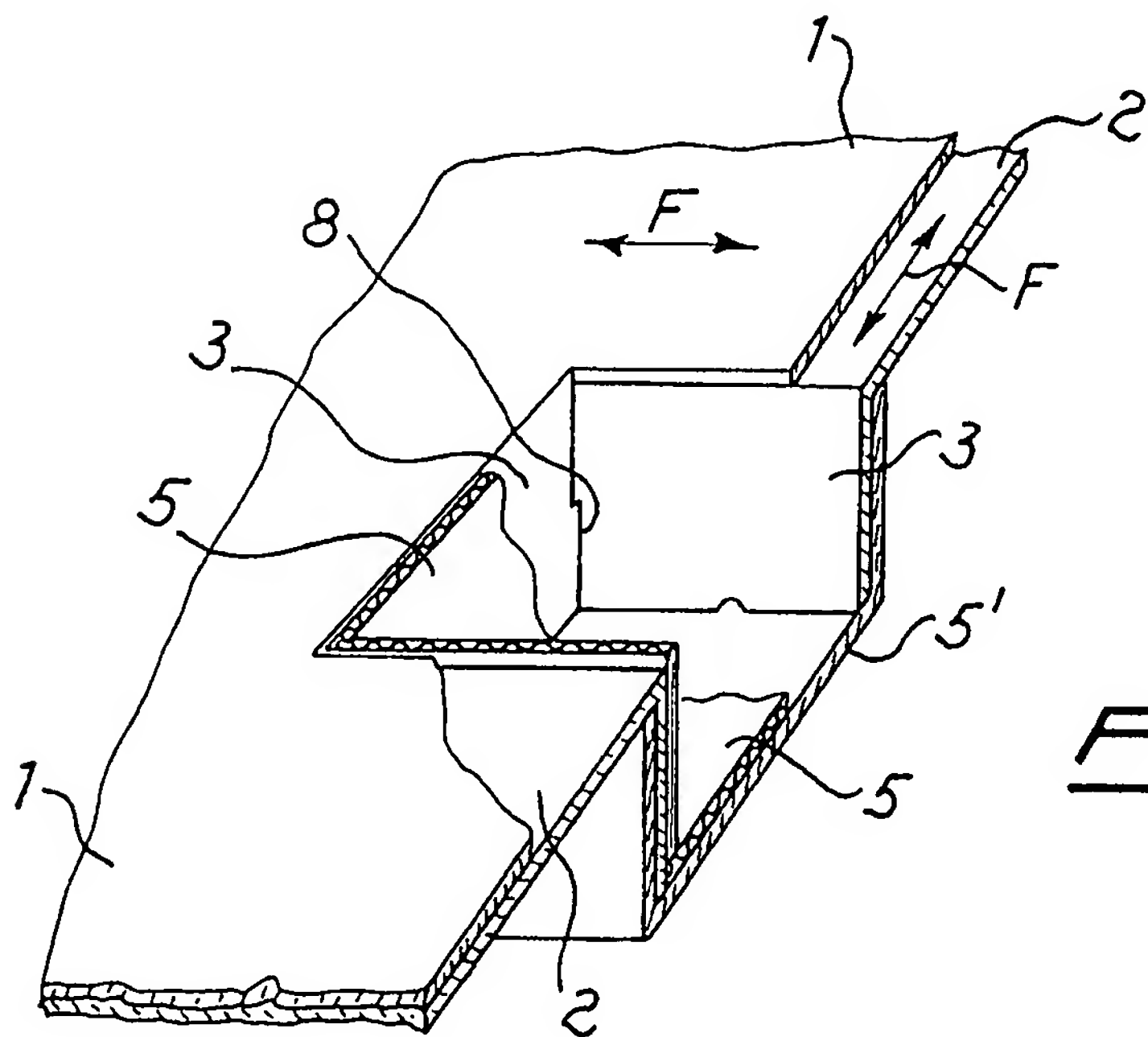
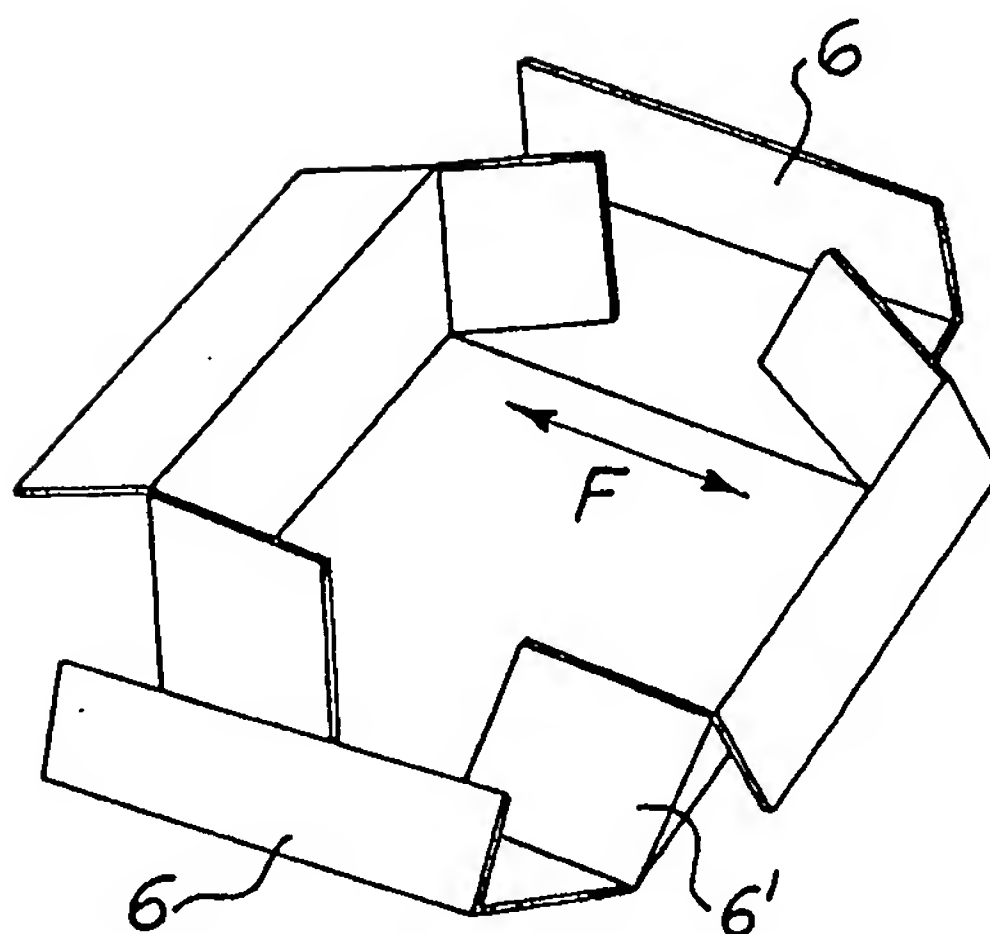


Fig. 5

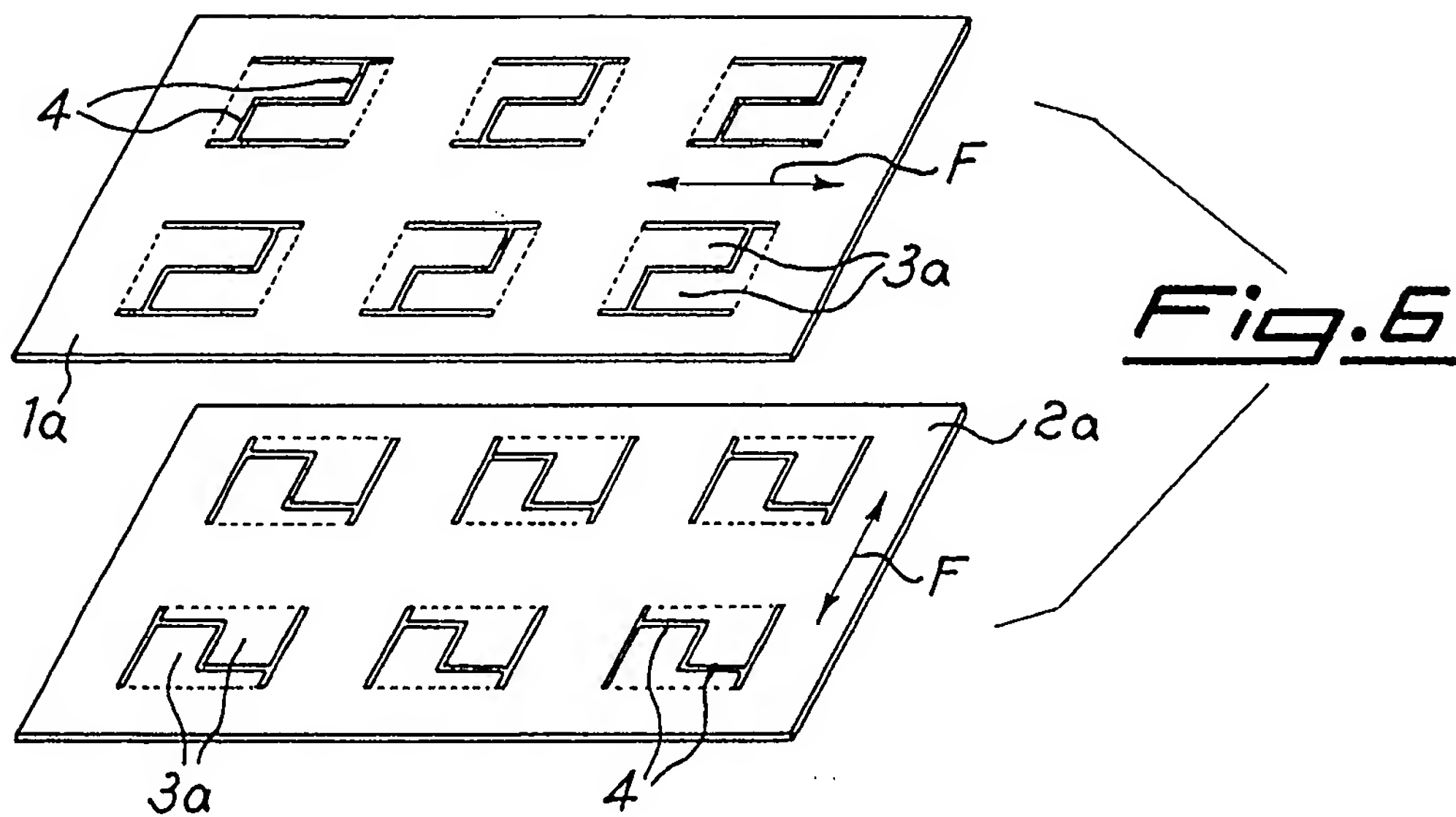


Fig. 7

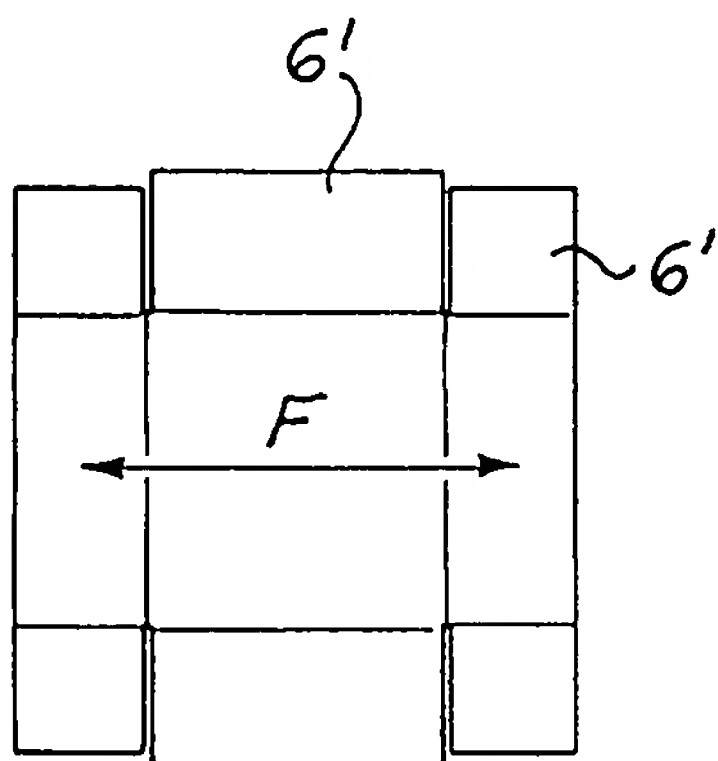
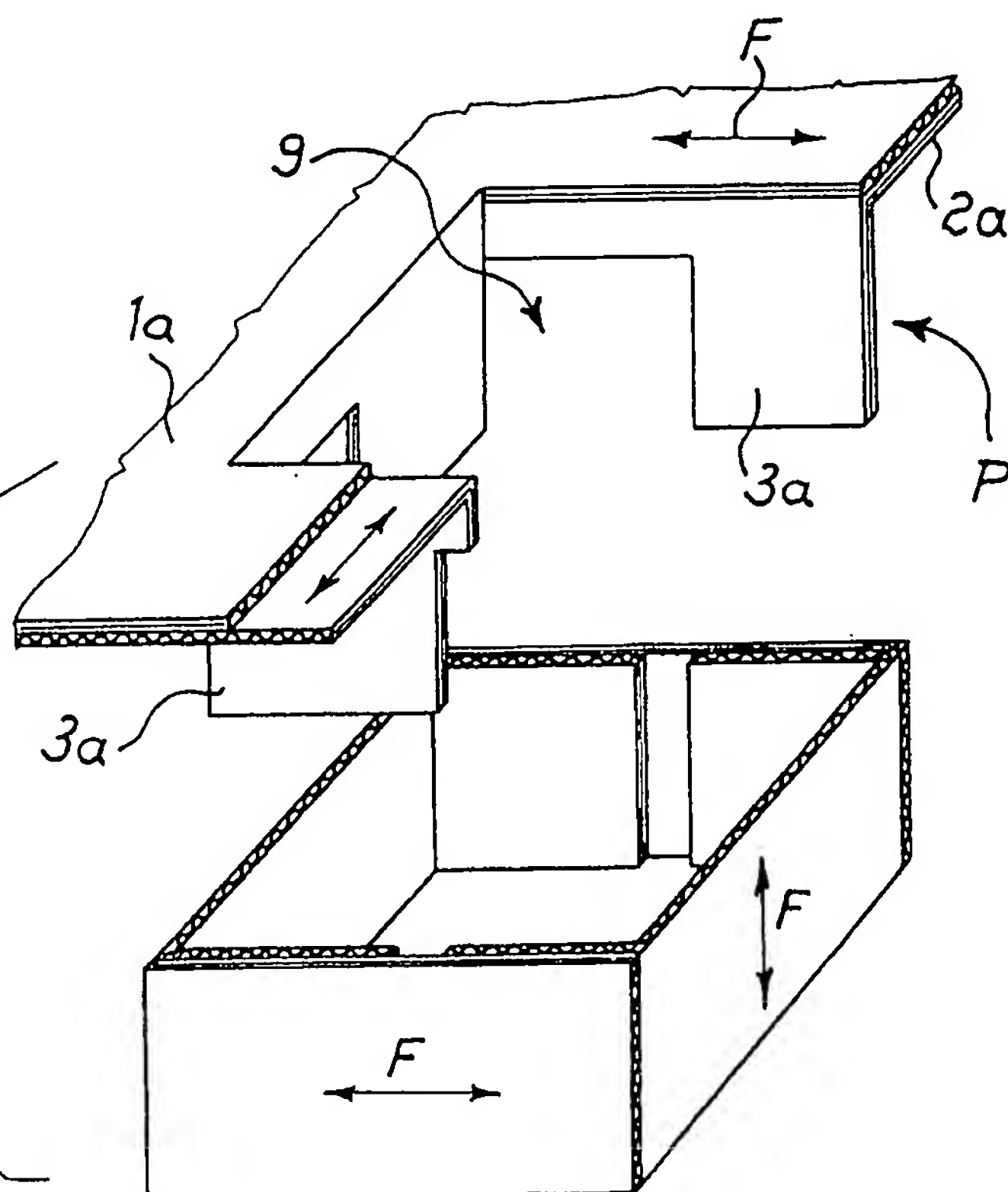


Fig. 8





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EUROPEAN SEARCH REPORT

Application Number

EP 92 10 0104

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,X	DE-U-9 106 264 (ZEAWELL) * the whole document *	1-7, 11, 12	B65D19/34 B65D19/40
P,A	---	10	
A	US-A-4 015 544 (SZATKOWSKI) * column 1, line 32 - line 52 * * column 2, line 9 - column 3, line 37; figures 1-8 *	1-3, 7, 8, 10-12	
A	GB-A-1 477 137 (TRI-CORR CONTAINERS) * figures 1-3 *	1, 3, 7, 8, 10	
A	GB-A-1 163 135 (ALPHA CONTAINERS) * page 2, right column, line 73 - line 86 *	1, 3, 4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65D
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 23 APRIL 1992	Examiner SPETTEL J. D. M. L.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons * : member of the same patent family, corresponding document			